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ENLISTMENT PROJECTION MODEL IMPROVEMENT PROGRAM(U) ARMY
RECRUITING COMMAND FORT SHERIDAN ILL M TRAUTWEIN
DEC 82 USAREC-RN-82-5

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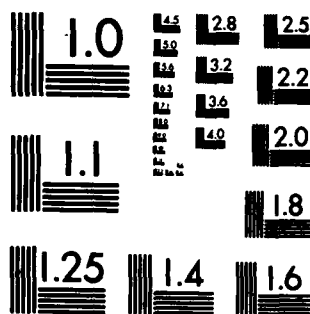
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ENLISTMENT PROJECTION MODEL

IMPROVEMENT PROGRAM

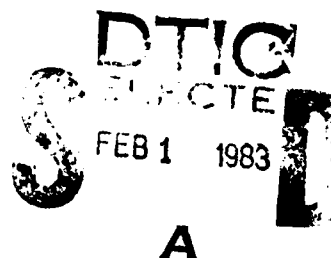
by

Dr. Marvin Trautwein

December 1982

USAREC RESEARCH NOTE 82-5

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ABSTRACT

The Army is trying to improve its method of assigning recruiting missions. This research note details the latest effort in this regard. The US Army District Recruiting Command missions for AFQT category I-III A male high school seniors and high school graduates are assigned according to a log-linear regression/forecasting model. All other mission categories are assigned according to the best available estimate of market population.

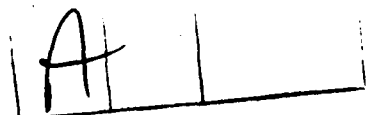
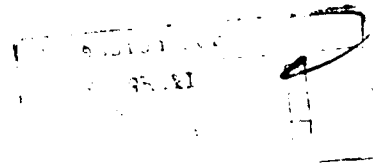


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I. BACKGROUND.

Since late 1979, Headquarters, US Army Recruiting Command (HQ, USAREC) has assigned recruiting missions to district recruiting commands (DRC) by using computer models. The mission distribution model used for allocating FY 81 and FY 82 missions is described by Fagan (1981) and Morey (1982).

Starting with a DRC quarterly data base, it used linear regression and projection to forecast seven dependent variables for the next four quarters. The forecasts were constrained to be no greater than 30 percent above the last production observation and no less than the average of the last production observation and the average of all past production. The seven forecast variables were then apportioned into 13 accession mission categories and 19 contract mission categories. The DRC percentage of the Command total in each mission category was applied to the Command mission (assigned by the Department of the Army) to give the desired mission breakout.

There were several problems with this procedure. HQ USAREC observed that nearly all forecasts constrained (either high or low) so that the regression/projection was not contributing much to mission assignment. Morey (1982) recommended many changes, among them the use of a nonlinear multiplicative model, a monthly data base, more detailed advertising data, limiting modeling efforts to supply-limited mission categories, and the use of Park's regression.

II. RECENT CHANGES.

During October and November 1982, the model was subjected to many experimental changes. The result of these experiments is a model that attempts to forecast only for AFQT category I-III high school senior/high school graduate male contracts. The model used is multiplicative-exponential, linear in logs, and thus solvable by ordinary least squares. Hispanic population was added to the set of independent variables. REACT leads (coupons from magazine advertisements) and recruiters' aides were dropped. The dependent variable and all independent variables that were not rates already, were divided by high school seniors, putting the model on a "per-high-school-senior" basis. R^2 s (correlation coefficient) from the resulting five regional recruiting command regressions are shown in Table 1. All appear acceptable except Southwest, which needs more work. Adjusted R^2 is a better statistic for explaining the variance than R^2 , because it compensates for the loss in degrees of freedom in fitting the model. (In the extreme, one can get perfect R^2 s by using a large enough number of independent variables.)

Table 1. Regression correlation coefficients for regional recruiting commands.

<u>Region</u>	<u>R^2</u>	<u>Adjusted R^2</u>
Northeast	.98	.98
Southeast	.84	.82
Southwest	.59	.56
Midwest	.78	.74
Western	.86	.83

The five region equations are evaluated with DRC projected independent variable data to produce DRC forecasts for the next four quarters. These forecasts appear quite reasonable without the use of constraints.

Since the model forecasts only for AFQT category I-IIIA senior and graduate males, other mission categories must be allocated by other means. To this end, a market population data set was developed for the 56 DRC for the different categories of contract missions. Data were found for all categories except non-high school graduates. Past production was substituted in these categories temporarily. For a given DRC, the ratio of AFQT category I-IIIA senior males to category I-IIIA high school graduate males was used to divide the projected category I-IIIA graduate senior male number into seniors and graduates. Then, as in the previous model, the DRC percentage of Command was computed for each mission category and used to allocate Command mission.

III. FUTURE IMPROVEMENTS

More detailed advertising expenditure data, disaggregated to months, have been requested. When these become available, the model's data base will be made monthly, to allow for analysis of lags. Park's regression may be available by summer of 1983, when the Statistical Analysis System is expected to be available for HQ USAREC UNIVAC computers. Hopefully, valid data will be found for non-high school graduate population. Southwest region needs further analysis aimed at improving the anemic R^2 . As Morey strongly suggests, the model should be validated against production data.

IV. REFERENCES.

1. Morey, Richard C., and McCann, John M., "The Army's Enlisted Production Model: A Critique and Suggested Directions for the Future", unpublished research report, The Fuqua School of Business, Duke University, August, 1982.

2. Fagan, Thomas W., "USAREC Distribution Model," unpublished paper, Department of Economics, U.S. Military Academy, October, 1981.

ENLISTMENT PROJECTION MODEL

HISTORICAL DATA BASE AS OF 12-16-82

USAPCPAE-DE DR. TRAUTWEIN PHONE: (312) 926-2679 (H) 454-2679

VARIABLES

NAME	MEANING	NAME	MEANING
TIME	FISCAL YEAR-ZERO-QUARTER	DOD NPSN ACCN	DOD NON-PRIOR SERVICE MALE ACCESSIONS
DRC	DISTRICT RECRUITING COMMAND CODE	DOD NSDGM ACCN	DOD HIGH SCHOOL DIPLOMA GRADUATE MALE ACCESSIONS
AREA	DRC AREA IN SQUARE MILES	INCME	MEDIAN DISPOSABLE FAMILY INCOME
AMA	QUALIFIED MILITARY AVAILABLE	BLACK POP	BLACK POPULATION
HISP	HISPANIC POPULATION	ARMY MNSG CONT	ARMY MNSG MALE CONTRACTS (MC 1-3A)
MS SNRS	MALE HIGH SCHOOL SENIORS (MC 1-3A)	ARMY HSG CONT	ARMY HIGH SCHOOL GRAD/SP (MC 1-3A) MALE CONTRACTS
RLTDS	ON-PRODUCTION ARMY RECRUITERS	ARMY ENLST PRNP	ACTIVE ARMY ENLISTMENT PROPENSITY
ARMY NPSN ACCN	ARMY NON-PRIOR SERVICE MALE ACCESSIONS	ATHE NANNM	HOMETOWN RECRUITER RATES (AVERAGE)
ARMY NSDGM ACCN	ARMY HIGH SCHOOL DIPLOMA GRADUATE MALE ACCESSIONS	ARMY 1-3A NPSN	ARMY MC 1-3A MALE ACCESSIONS
UNEAP	DRC OVERALL UNEMPLOYMENT	ARMY PS TOT	ARMY PRIOR SERVICE TOTAL ACCESSIONS
ACTR EXP	PERCENT OF DRC RECRUITERS WITH ONE OR MORE YEARS EXPERIENCE	ARMY MNS FEM	ARMY GRAD-SP FEMALE CONTRACTS (MC 1-3A)
ARMY ACTP 300	ARMY RECRUITERS AS PERCENT OF DOD RECRUITERS BY DRC	DRC ADV	DRC LOCAL ADVERTISING EXPENDITURES

ENLISTMENT PROJECTION MODEL

PROJECTION DATA BASE AS OF 12-16-82

USAPCPAE-RE DR. TRAUTWEIN PHONE: (312) 926-2679 (H) 459-2679

VARIABLES

NAME	MEANING	NAME	MEANING
TIME	FISCAL YEAR-ZERO-QUARTER	NOB NPSM ACCN	NOB NON-PRIOR SERVICE MALE ACCESSIONS
DRC	DISTRICT RECRUITING COMMAND CODE	NOB HSDGM ACCN	NOB HIGH SCHOOL DIPLOMA GRADUATE MALE ACCESSIONS
AREA	DRC AREA IN SQUARE MILES	INCOME	MEDIAN DISPOSABLE FAMILY INCOME
AWA	(MIA)-TED MILITARY AVAILABLE	BLACK POP	BLACK POPULATION
HISP	HISPANIC POPULATION	ARMY HNSG CONT	ARMY HNSG MALE CONTRACTS (NO 1-3A)
HS SNRS	MALE HIGH SCHOOL SENIORS (NO 1-3A)	ARMY HSG CONT	ARMY HIGH SCHOOL GRAD/SR (NO 1-3A) MALE CONTRACTS
RCTR	ON-PRODUCTION ARMY RECRUITERS	ARMY ENLST PROP	ACTIVE ARMY ENLISTMENT PROPENSITY
ARMY NPSM ACCN	ARMY NON-PRIOR SERVICE MALE ACCESSIONS	AIDE NNMMD	HOMETOWN RECRUITER AIDES (AVERAGE)
ARMY HSDGM ACCN	ARMY HIGH SCHOOL DIPLOMA GRADUATE MALE ACCESSIONS	ARMY 1-3A NPSM	ARMY NO 1-3A MALE ACCESSIONS
UNEMP	DRC OVERALL UNEMPLOYMENT	ARMY PS TOT	ARMY PRIOR SERVICE TOTAL ACCESSIONS
RCTR EXP	PERCENT OF DRC RECRUITERS WITH ONE OR MORE YEARS EXPERIENCE	ARMY NPS FEM	ARMY GRAD-SR FEMALE CONTRACTS (NO 1-3A)
ARMY RCTR NOB	ARMY RECRUITERS AS PERCENT OF NOB RECRUITERS BY DRC	DRC ADV	DRC LOCAL ADVERTISING EXPENDITURES

USARP-PNE-RE

B-2

ENLISTMENT PROJECTIONS COBB-DOUGLAS MODEL

FOR COMMAND LEVEL: ALBANY

DRG -PPC COEFFS

DEPENDENT VARIABLE: MSGCOM

RSQ= .97861

REGRESSION COEFFICIENTS

AREA = -.18498 DMA = .38363 REACT = -.11228 MSGMR = .00000
 RUTPS = 1.73200 UNEMP = .31210 RCTREX = .46430 INCOME = 1.44679
 BLACKS = -.11126 PROPEN = .89080 AIDES = .00000 BODRGR = -.82573
 BODM = .00000 BODM = .00000 ADVCS = .00000 MEVAR = .00000
 SEVAR = .00000 SUVAR = .00000 MUVAR = .00000 Q1VAR = .00000
 Q2VAR = .21416 Q3VAR = .00000 BRCADV = .00000 POLICY = .00000
 CONSTA = -18.39925

MSGCOM

PROJECTIONS

QTR1= 127. QTR2= 162. QTR3= 134. QTR4= 124. YEAR= 547.

ENLISTMENT PROJECTIONS COBB-DOUGLAS MODEL

FOR COMMAND LEVEL: BALTIMORE

DRG -PPC COEFFS

DEPENDENT VARIABLE: MSGCOM

RSQ= .97861

REGRESSION COEFFICIENTS

AREA = -.18498 DMA = .38363 REACT = -.11228 MSGMR = .00000
 RUTPS = 1.73200 UNEMP = .31210 RCTREX = .46430 INCOME = 1.44679
 BLACKS = -.11126 PROPEN = .89080 AIDES = .00000 BODRGR = -.82573
 BODM = .00000 BODM = .00000 ADVCS = .00000 MEVAR = .00000
 SEVAR = .00000 SUVAR = .00000 MUVAR = .00000 Q1VAR = .00000
 Q2VAR = .21416 Q3VAR = .00000 BRCADV = .00000 POLICY = .16000
 CONSTA = -18.39925

MSGCOM

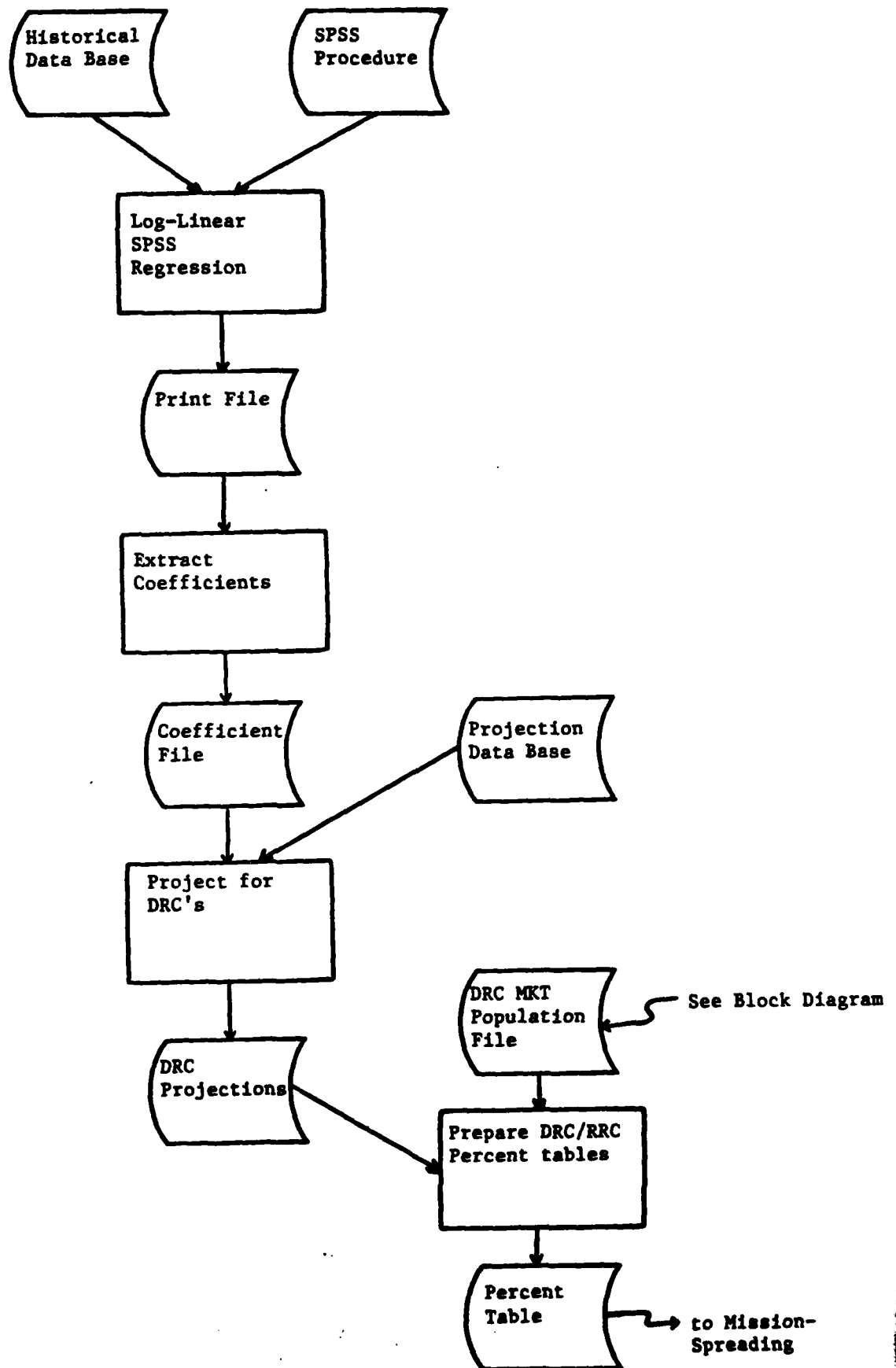
PROJECTIONS

QTR1= 346. QTR2= 441. QTR3= 366. QTR4= 336. YEAR= 1489.

Missions

TEST RUN FOR RESEARCH NOTE,														RUN 12-16-82 AT 1200									
(N)	(N)	(N)	(N)	(N)	(N)	(N)	(N)	(F)	(F)	(F)	(F)	(F)	(F)	PS	(N)	(N)	(N)	(N)	(F)	(F)	(F)	(F)	TOTAL
IIIA	IIIA	IIIB	IIIB	IV	IV	IIIA	IIIB	IIIA	IIIB	IIIB	IIIB	IV	IV		TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	
HSSR	MSDG	HSSR	MSDG	HSSR	MSDG	HSSR	MSDG	HSSR	MSDG	HSSR	MSDG	HSSR	MSDG		HSSR	MSDG	HSSR	MSDG	HSSR	MSDG	HSSR	MSDG	
COMMAND: ATLANTH																							
RE-FY830	99	224	40	58	0	143	37	48	5	48	0	19	0	0	35	139	425	85	649	5	59	64	748
RE-FY830	99	224	40	58	0	143	37	48	5	48	0	19	0	0	35	139	425	85	649	5	59	64	748
COMMAND: BECKLEY																							
RE-FY830	43	96	23	32	0	53	28	7	3	21	4	10	4	0	11	66	181	35	282	3	31	34	327
RE-FY830	43	96	23	32	0	53	28	7	3	21	4	10	4	0	11	66	181	35	282	3	31	34	327
COMMAND: CHARLOTTE																							
RE-FY830	60	128	31	42	0	63	46	15	4	32	0	14	0	0	26	91	233	61	385	4	46	50	461
RE-FY830	60	128	31	42	0	63	46	15	4	32	0	14	0	0	26	91	233	61	385	4	46	50	461
COMMAND: COLUMBIA																							
RE-FY830	82	183	29	41	0	75	44	11	3	25	0	13	0	0	31	111	299	55	465	3	38	41	537
RE-FY830	82	183	29	41	0	75	44	11	3	25	0	13	0	0	31	111	299	55	465	3	38	41	537
COMMAND: JACKSONVILLE																							
RE-FY830	132	304	42	61	0	119	160	0	7	56	0	21	0	0	64	174	484	160	818	7	77	84	966
RE-FY830	132	304	42	61	0	119	160	0	7	56	0	21	0	0	64	174	484	160	818	7	77	84	966
COMMAND: LOUISVILLE																							
RE-FY830	90	194	36	50	0	71	75	0	5	37	0	16	0	0	23	126	315	75	516	5	53	58	597
RE-FY830	90	194	36	50	0	71	75	0	5	37	0	16	0	0	23	126	315	75	516	5	53	58	597
COMMAND: MIAMI																							
RE-FY830	97	205	32	44	0	62	103	22	4	35	0	16	0	0	31	120	311	125	565	4	51	55	651
RE-FY830	97	205	32	44	0	62	103	22	4	35	0	16	0	0	31	120	311	125	565	4	51	55	651
COMMAND: MONTGOMERY																							
RE-FY830	108	238	40	57	0	146	58	41	5	35	0	19	0	0	36	142	441	99	688	5	54	59	783
RE-FY830	108	238	40	57	0	146	58	41	5	35	0	19	0	0	36	142	441	99	688	5	54	59	783
COMMAND: NASHVILLE																							
RE-FY830	92	205	51	71	0	109	80	7	7	53	0	23	0	0	33	143	385	87	615	7	76	83	731
RE-FY830	92	205	51	71	0	109	80	7	7	53	0	23	0	0	33	143	385	87	615	7	76	83	731
COMMAND: RALEIGH																							
RE-FY830	77	162	34	46	0	73	36	11	4	27	0	15	0	0	27	111	281	47	439	4	42	46	512
RE-FY830	77	162	34	46	0	73	36	11	4	27	0	15	0	0	27	111	281	47	439	4	42	46	512
COMMAND: RICHMOND																							
RE-FY830	101	208	32	42	0	66	45	55	5	37	0	10	0	0	40	133	316	100	549	5	47	52	641
RE-FY830	101	208	32	42	0	66	45	55	5	37	0	10	0	0	40	133	316	100	549	5	47	52	641
COMMAND: SAN JUAN																							
RE-FY830	23	44	9	11	0	41	12	11	1	4	0	4	0	0	33	32	96	23	151	1	8	9	193
RE-FY830	23	44	9	11	0	41	12	11	1	4	0	4	0	0	33	32	96	23	151	1	8	9	193
COMMAND: SOUTHEAST REC																							
RE-FY830	1004	2191	399	555	0	1021	724	228	53	402	0	180	0	0	390	1403	3767	952	6122	53	582	635	7147
RE-FY830	1004	2191	399	555	0	1021	724	228	53	402	0	180	0	0	390	1403	3767	952	6122	53	582	635	7147

RUN CHART



BLOCK DIAGRAM

